The Economics of Production and Marketing of Greenhouse Crops in Alberta

1987

Agdex 821-53

Alberta
AGRICULTURE
Production Economics Branch
Economic Services Division

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1988 10 2M

The Economics of Production and Marketing of Greenhouse Crops in Alberta 1988

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October, 1988

Acknowledgement

The author wishes to express sincere thanks to all the greenhouse operators in Alberta who willingly provided valuable data for this study. The assistance provided by Darlene Moisey and Paul Bailey, Research Assistants, in the collection of data from the study participants is gratefully acknowledged. Paul also did a considerable amount of work in analyzing the data and in development of the report.

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Foreword

Many Alberta greenhouse growers and individuals interested in the horticultural sector recognize that Alberta has the potential to greatly expand flower and vegetable production. Given such favorable conditions, questions have been asked as to why the provincial production of fresh produce has not significantly increased?

To answer these questions, in 1977 the Production Economics Branch of Alberta Agriculture was requested by greenhouse operators to undertake a comprehensive economic evaluation of the flower and vegetable sector. Since then, several reports documenting production costs and returns and factors affecting production of greenhouse crops have been published. These studies have been instrumental in establishing some programs such as the primary producers energy rebate program, and helped gain eligibility to loans from the Alberta Agricultural Development Corporation.

This greenhouse report examines the level of investment and production costs and returns for Alberta greenhouses by region, size, and crop, and updates the information contained in the 1983-84 study. It also reports on problems related to production, transportation and other areas of concern as expressed by greenhouse operators. This study, which covers 1987, will be repeated for the 1988 crops.

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Branch Head
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SECTION I

INTRODUCTION

At the request of the Protected Crops Advisory Committee, a study of the greenhouse industry was undertaken to develop production costs and returns information for various greenhouse crops.

The greenhouse industry in the province has gone through several adjustments, therefore the need was felt to estimate costs based on current conditions so that the industry can change accordingly. Because of changing economic conditions, previously compiled information on the greenhouse industry became more or less obsolete. The cost of natural gas and greenhouse supplies became major concerns in the late 1980's. The specific request for another study of the industry was made primarily to update some of the information compiled during the early 1980's, and to evaluate the financial viability of the industry in the province.

Significant increases in natural gas cost for heating greenhouses and the price of greenhouse supplies created some economic difficulties for greenhouse operations in the province. Realizing these difficulties, the provincial government introduced an energy rebate program for primary agricultural producers whereby greenhouse operators can receive financial assistance to a maximum of $4,850 to supplement heating expenses.[1]

Surveys of the greenhouse industry were undertaken during the 1978-79, 1979-80, 1982-83, 1983-84 crop years, and in the winter/spring

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1 The Primary Producers' Energy Rebate program was introduced in October 1982. Under this program a greenhouse operator could receive a maxium assistance of $4,850 towards natural gas heating costs.

of 1987, to develop production costs and returns information for the major greenhouse crops and for various sizes of greenhouses.

Four reports, one for each crop year, were published and have been used as guidelines for greenhouse investment decisions. The reports highlighted problems in production, marketing, transportation, availability of finance and other concerns of greenhouse operators in Alberta.

This report provides the most current information on greenhouse production costs and returns for the major greenhouse crops and by the size of the greenhouse operation for the 1987 crop year.

Objectives of the Study

The major objectives of the study were:

1) Determination of the structure of the greenhouse industry in Alberta.
2) Estimation of greenhouse production costs and returns by major crops.
3) Identification of the main factors influencing production and marketing of greenhouse crops in Alberta.
4) Identification of major problems experienced by greenhouse producers in Alberta.

The Study Sample

The same questionnaire as used for the previous study was again used to obtain the required information from a selected sample of greenhouse operators across the province. Twenty-eight greenhouse operators were interviewed in order to obtain production costs and returns information for 1987.

Method of Analysis

The technique used to analyze the data was "SPSS" (Statistical Package for the Social Sciences). SPSS is an integrated system of computer programs for the analysis of social science data. It provides the user with a comprehensive set of procedures for data transformation and file manipulation, and offers the researcher a large number of statistical routines commonly used in the social sciences.[1]

After completion of the questionnaire, data were reviewed to make sure that no information was missing before being keypunched for analytical purposes.

Each greenhouse operation was analyzed separately and the participant received a detailed personalized report of his/her greenhouse. The study was divided into two geographical groups, three size groups, and crop groups of cucumbers, tomatoes, bedding plants and mums. The cucumber group was further subdivided into two groups, media groups, and soil vs. pots and bags. This breakdown provided representative cost and return estimates related to the type of crop produced and size of the greenhouse operation.

Hail

Hail is a significant concern for Alberta greenhouse operators. Its unpredictable nature and potentially devastating consequences make it a serious risk to greenhouse business. Furthermore, some areas of the province are more likely to receive hail than others (Figure 1). Due to the risk involved in greenhouse investment losses from hail, the Alberta Hail and Crop Insurance Corporation (AHCIC) will not insure greenhouse crops and buildings. Therefore, if risk of investment losses are to be

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1 Norman, H. Nie; Dale H. Bent and C. Hadlai Hull, Statistical Package For The Social Sciences, McGraw-Hill Book Company, New York, April 1971, pp. 1-3.

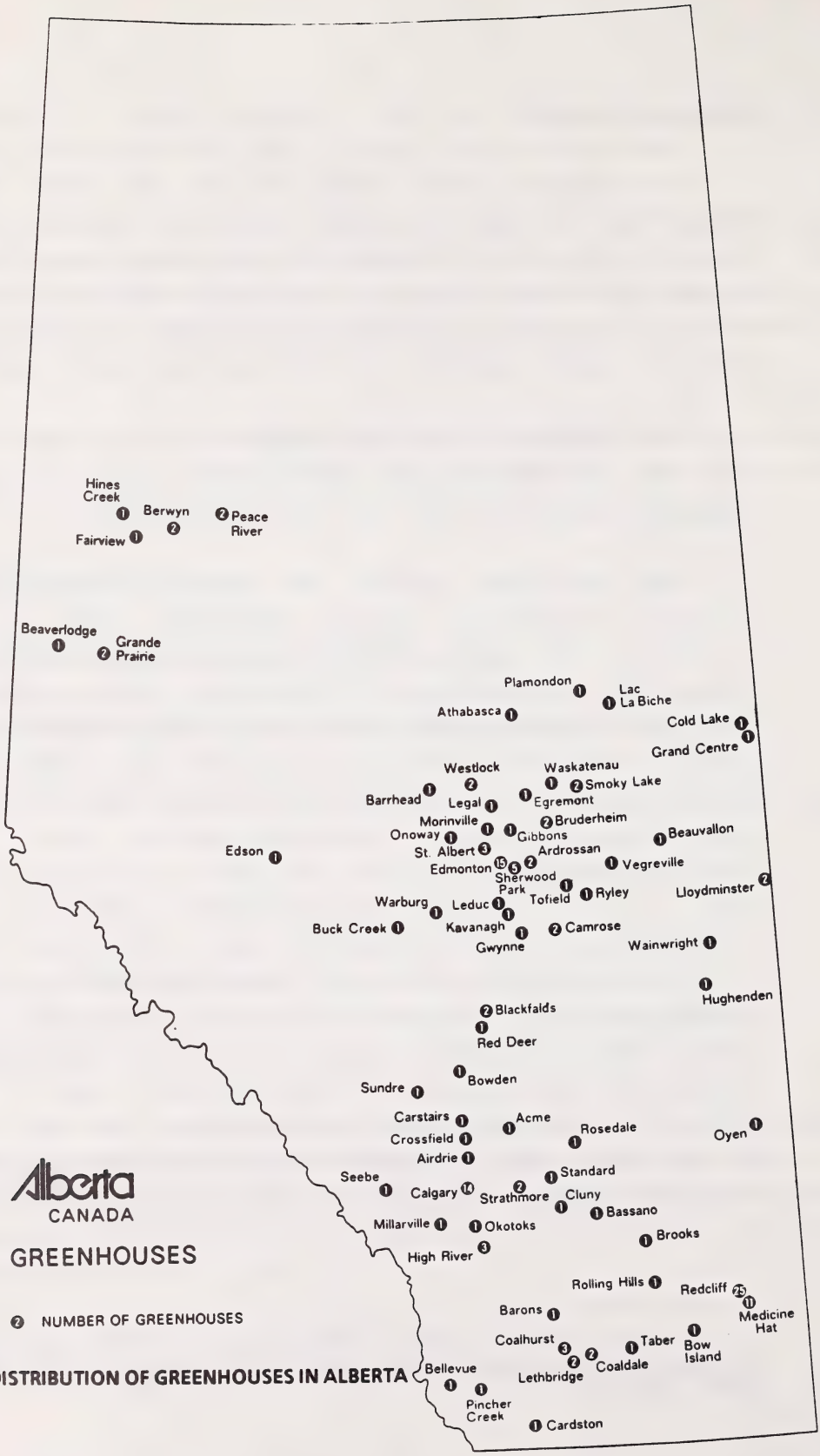

FIGURE 1: DISTRIBUTION OF GREENHOUSES IN ALBERTA

minimized, investors should try to build greenhouses in areas that are less hail prone and use hail resistant covering materials. As shown by the map, the regions with the highest probability of hail damage are located in a triangle shaped region of central Alberta. This area stretches from the Rocky Mountains to Breton-Stettler, and south toward Cochrane. Over an extended period of time, it is probable that greenhouse operations in this west-central part of the province would have the highest financial losses resulting from hail damage.

Although the map is a useful guide, showing regions where hail damage occurs, it should be noted that within these broadly outlined areas there are pockets where hail is either more or less frequent than the map would indicate. Therefore, to determine the probability of hail damage it is best to consult the map of "Full Cover Hail Insurance Premium Rates" published by the Alberta Hail and Crop Insurance Corporation. This map shows the probability of hail damage by township; the numbers printed on the map give an impression of how frequently damaging hail has occurred over the years. For example, if an area has been designated a premium rate of 4, then another area with a premium rate of 12 would have three times the probability of receiving damaging hail.

If hail insurance is not available, or if the premiums are so high that it is not financially feasible, then other alternatives should be considered. There are basically two alternatives to private and governmental hail insurance; they are self insurance and greenhouse design modifications. Self insurance means that in profitable years the greenhouse owner sets aside a portion of the profits, so that in a year when hail damage occurs funds are available for repairs. This scheme requires a large amount of discipline on the part of the greenhouse operator and problems may be encountered in the first few years of operation as limited funds would be available if hail damage should occur. The second scheme requires knowledge of the flexibility of greenhouse coverings and their resistance to breakage. It also requires knowledge of greenhouse location in relation to windbreaks and other barriers, both natural and artificial, that could reduce hail damage.

It would be advisable, then, for greenhouse producers in high hail risk areas to implement measures to reduce the probability of hail damage to greenhouse buildings and crops.

SECTION II

GREENHOUSE OPERATIONS IN ALBERTA

Although greenhouses in Alberta are scattered throughout the province, more than two-thirds of these operations are located in the south and south-central regions. The area around Medicine Hat is called "the greenhouse belt" of Alberta because of the Red Hat Co-op (a producer organization responsible for marketing cucumbers) and the large number of greenhouses in this area. Most greenhouse operations are located in cities and towns because of easy access to labour, marketing facilities, utilities and the services necessary for greenhouse operation. Because of very high land prices and taxes, during the last several years a few new greenhouses have been built at a distance from major population centres.

Survey of the Greenhouse Industry

According to a survey[1] of the greenhouse industry done in 1986, there were approximately 230 commercial greenhouse operations in Alberta with a total area of 6,043,040 square feet (561,398 square metres) or 138.9 acres (56.2 hectares).

This comprehensive survey, undertaken by the Alberta Tree Nursery and Horticulture Centre in Edmonton, provided detailed information on the structure of the greenhouse industry in the province. It reported on the types of crops grown in greenhouses, heating systems, types of greenhouse material, marketing of greenhouse produce, (wholesale and retail operations) and greenhouse operators' concerns, etc.

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1 Cathy Coyne and Mirza Mohyuddin, "Greenhouse Industry in Alberta", Alberta Tree Nursery and Horticulture Centre, Edmonton, October, 1986.

The three regions with the largest greenhouse area in the province are Medicine Hat (38 percent), Edmonton (21 percent), and Red Deer (12 percent). The remaining 29 percent of greenhouse area is scattered

TABLE 1

DISTRIBUTION OF GREENHOUSE AREA BY MAJOR CENTERS

	Region	Area in Square Meters	Area in Square Feet	Percent of Total
1.	Fort McMurray	1 894	20,382	0.43
2.	Grande Prairie	9 314	100,259	2.14
3.	Whitecourt	44 506	479,067	10.22
4.	Edmonton	90 189	970,794	20.70
5.	Bonnyville	5 051	54,364	1.16
6.	Lloydminster	3 455	37,186	0.79
7.	Red Deer	51 712	556,625	11.87
8.	Calgary	40 303	433,820	9.25
9.	Medicine Hat	165 680	1,783,380	38.03
10.	Lethbridge	23 541	253,397	5.40
	TOTAL	435 645	4,688,974	100.00

TABLE 2

DISTRIBUTION OF GREENHOUSE AREA BY SIZE OF OPERATION

Size of Operation (Sq Ft)	Number Surveyed	Percent of Total Surveyed
less than 10,000	84	39.81
10,000 to 19,999	56	26.54
20,000 to 50,000	54	25.59
more than 50,000	17	8.06
TOTAL	211	100.00

throughout the province, from Peace River in the north to Lethbridge in the south. Table 1 provides information on the size of the greenhouse industry in the province. Table 2 classifies greenhouse operations by area (size of greenhouse operation). Figure 2 shows the distribution of greenhouses in the province.

Table 3 lists the number of greenhouse operations surveyed in each city/town in 1986. The province was divided into these areas to obtain a better understanding of the location and size of greenhouse operations.

TABLE 3

NUMBER OF GREENHOUSES BY LOCATION

Area	Total Number Surveyed	Number in Regional Center
1. Fort McMurray	4	2
2. Grande Prairie	8	1
3. Whitecourt	24	3
4. Edmonton	44	21
5. Bonnyville	7	2
6. Lloydminster	5	1
7. Red Deer	31	7
8. Calgary	22	10
9. Medicine Hat	41	35
10. Lethbridge	25	9
TOTAL	211	91

According to the survey done by the Alberta Tree Nursery and Horticulture Centre, 32 percent of the greenhouses have glass or glazing material as a covering, 41 percent have polyethylene, 24 percent have fiberglass, and the remaining three percent have polycarbonate.

Statistics Canada also conducts a survey of the greenhouse industry every year to identify the number of commercial operations in the province, crops grown, and the total output of crops produced in a controlled environment.

FIGURE 2: ALBERTA AGRICULTURAL REGIONS

In 1986, although all greenhouse operations in Alberta were contacted by Statistics Canada, only 59 firms reported on their operations. The area reported by these firms was 2.683 million square feet, which is less than half of the area reported in the 1986 census. In 1983, the number of firms reporting on their operations was 81. Greenhouse area reported by these firms was 2.379 million square feet. In 1984 the number of firms returning Statistics Canada questionnaires increased to 109, and the overall area reported by these firms also increased to 2.755 million square feet. In 1985 the number of greenhouse firms reporting on their operations declined to 106 and the total greenhouse area decreased to 2.573 million square feet. Table 4 provides greenhouse area by structure (glass and plastic) and sales of produce as reported by most of the commercial greenhouse growers in the province.

The Statistics Canada survey of the greenhouse industry reported average area per firm (Table 4), both under glass and plastic, at 29,373 square feet in 1983. It decreased to 25,276 square feet per firm in 1984, and continued to decline to 24,274 square feet in 1985. However, in 1986, average area per firm was 45,482 square feet, a substantial increase over 1985. This increase in average area per firm can be attributed to a greater number of large greenhouses reporting on their operations for this survey. In 1986, the number of firms reporting on their operations was down to 59, the lowest number of firms reporting during the last several years.

Gross sales of greenhouse produce, as reported in the Statistics Canada survey (Table 4), amounted to $15.4 million in 1983, and increased to $18.9 million in 1984. Average sales per firm were $190,613 in 1983 and $173,784 in 1984. Total sales of greenhouse produce increased to $22.6 million in 1985 and rose to $23.7 million in 1986 despite the smaller number of firms reporting on their operations compared to earlier years.

Average sales per firm increased to $213,578 in 1985 and then jumped up to $402,513 in 1986. Average sales per square foot were

TABLE 4

GREENHOUSE AREA AND SALES OF VEGETABLES AND ORNAMENTAL FLOWERS IN ALBERTA

	1983	1984	1985	1986[p]
Number Reporting	81	109	106	59
Total Area Sq Ft	2,379,178	2,755,052	2,573,016	2,683,410
m^2	221 033	255 953	239 041	249 297
Average/Firm Sq Ft	29,373	25,276	24,274	45,482
m^2	2 729	2 348	2 255	4 225
Glass				
Number Reporting	36	47	42	29
Area Sq Ft	1,256,894	1,242,387	975,023	910,068
m^2	116 769	115 421	90 583	84 548
Average/Firm Sq Ft	34,914	26,434	23,215	31,382
Plastic				
Number Reporting	60	85	89	49
Area Sq Ft	1,122,284	1,512,665	1,597,993	1,773,342
m^2	104 264	140 531	148 458	164 749
Average/Firm Sq Ft	18,705	17,796	17,955	36,191
Sales				
Number Reporting	81	109	106	59
Total Sales ($)	15,439,669	18,942,432	22,639,257	23,748,288
Average/Firm ($)	190,613	173,784	213,578	402,513
Sales per Sq Ft ($)	6.49	6.88	8.80	8.85
Sales per m^2 ($)	69.85	74.01	94.71	95.26

[p] Preliminary figures

Source: Statistics Canada, GREENHOUSE INDUSTRY, Cat. No. 22 - 202, Annual, 1983-1986.

$6.49 in 1983, increasing to $6.88 in 1984, $8.80 in 1985 and finally $8.85 in 1986. Details regarding total area under glass and plastic, and total sales of vegetables, bedding plants, and ornamental flowers in Alberta for the years 1983 to 1986 are presented in Table 4.

The Statistics Canada surveys do not provide a complete picture of the greenhouse industry in Alberta because a large number of growers failed to provide the required information. Greenhouse operators should make an effort to complete the short, one page questionnaire as it is to their advantage to know the size of their industry and the types of crops produced. If such information were available it would be helpful for planning crops which can be marketed easily in order to maximize profits.

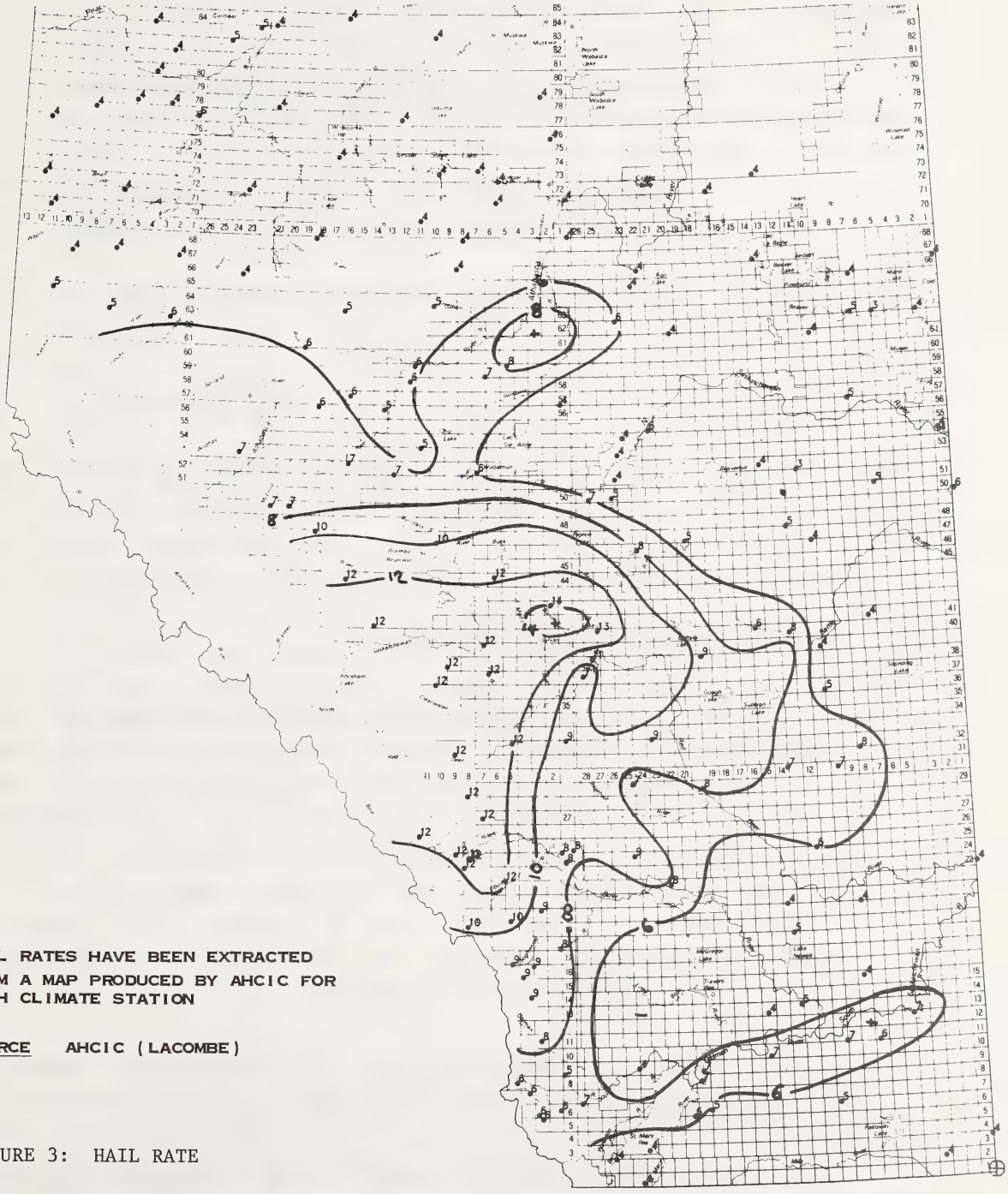
Greenhouse Area Surveyed by Type of Structure

The size of the greenhouse operations surveyed for the 1987 study ranged from 12,608 to 180,276 square feet (1,172 to 16,754 square metres). Distribution of the greenhouse area under glass, fiberglass, and plastic is presented in Table 5. Group I represents north and north-central Alberta (Regions 3, 4, 5, and 6), and Group II represents south and south-central Alberta (Regions 1 and 2). For the 1987 study, 28 greenhouse operators were selected and provided the required information.

Figure 3 shows the grouping of greenhouses by region. Growth in the greenhouse industry has been modest during the last few years. A few new greenhouses have been built and additions have been made to existing facilities. Although there have been some greenhouse closures, the overall size of the industry has increased. In Group 1, the total area under glass was 58,900 square feet (5 474 square metres), about 12 percent of the total greenhouse area surveyed in the north and north-central regions. Greenhouse area under fiberglass and plastic amounted to 118,842 square feet (11 045 square metres) or 24 percent, and 310,851 square feet (28 889 square metres) or 64 percent, respectively.

In Group II (south and south-central regions) the number of glass greenhouses reported by study participants was somewhat different from that in Group I. About 66 percent of the area surveyed was under glass, compared to 12 percent in Group I. Thirty-four percent of the area was under plastic. Group II operators did not report any glass. Greenhouse operators in Group II reported 404,750 square feet (37 603 square metres) under fiberglass, and 212,150 square feet (19 709 square metres) under double plastic, for a total of 616,900 square feet (57 312 square metres).

Greenhouses surveyed for the 1987 crop year occupied 1,105,493 square feet (102 741 square metres), of which 463,650 square feet (43 090 square metres) or 42 percent was under glass, 118,842 square feet (11 045 square metres) or 11 percent under fiberglass, and 523,001 square feet (48 606 square metres) or 47 percent was under plastic. The average area per grower in Group I was 44,243 square feet (4 112 square metres) compared with 36,288 square feet (3 371 square metres) for Group II. The average area for the entire study sample was 40,340 square feet (3 749 square metres). The southern half of the province has more glass structured greenhouses than the north and north-central areas. Greenhouses surveyed for the 1987 crop year are classified as to structure in Table 5.



HAIL RATES HAVE BEEN EXTRACTED FROM A MAP PRODUCED BY AHCIC FOR EACH CLIMATE STATION

SOURCE AHCIC (LACOMBE)

FIGURE 3: HAIL RATE

TABLE 5

GREENHOUSE AREA BY THE TYPE OF STRUCTURE
FOR THE GREENHOUSES SURVEYED

		Number Surveyed	Fibre Glass	Glass	Plastic	Total	Average Per Grower
Group I	sq ft	11	58,900	118,842	310,851	488,593	44,243
	m^2		5 474	11 045	28 889	45 408	4 112
Group II	sq ft	17	404,750	0	212,150	616,900	36,288
	m^2		37 603	0	19 709	57 312	3 371
Total	sq ft	28	463,650	118,842	523,001	1,105,495	39,413
	m^2		43 090	11045	48 606	102 741	3 663

Physical Characteristics of Greenhouses

Greenhouses in Alberta range from small sash roof "lean-to" houses constructed of a wood-frame sash, to large modern steel frame houses with truss supported roofs. Most new greenhouses are made of steel, wood or masonry, covered with either glass, double plastic, fiberglass, or a single layer of plastic. A 1984 survey by the Alberta Greenhouse Growers' Association reported over 5.1 million square feet (474 400 square metres) of greenhouse area in Alberta. The number of greenhouse operations surveyed was 213. Another 14 greenhouse operations could not provide any information.

During the last eight or nine years "HYDROPONICS" has emerged in the Alberta greenhouse industry and is being used in the production of tomatoes, cucumbers, and lettuce. Although this greenhouse crop production technique has been in use for quite some time in the United States, eastern Canada, and British Columbia, it was not until 1978-1979

Columbia, it was not until 1978-1979 that it was introduced in Alberta.[1] Over a dozen greenhouse operations in Alberta use the hydroponic methods of producing greenhouse crops, especially tomatoes. Several growers are evaluating the use of this technique for producing lettuce and other greenhouse crops. A very recent (November 1987) publication called "Economics of Hydroponic Greenhouse Production of Cucumbers and Tomatoes" is available from Alberta Agriculture for individuals who are interested in this new production method.

The major internal features of greenhouse systems in Alberta are as follows:

Heating Systems

A year round greenhouse operation is heated, using natural gas, steam, propane, or coal, to maintain optimum temperatures for crops grown during the winter months. Some vegetable producing greenhouses operate 10 months of the year and only close down during December and January. Almost all of the greenhouses in southern Alberta are heated by natural gas burners, and when combined with stove pipes these burners provide sufficient heating through natural air movement. Greenhouses in northern Alberta are equipped with natural gas boilers and hot water pipes for heating. All boiler heating systems have automatic temperature control devices.

In addition to heating systems, most greenhouses in Alberta are equipped with a pad and fan cooling system. The cooling system is

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1 "Hydroponics" is a crop production technique in a controlled environment which replaces soil with a sterile growing medium and automatic watering/feeding system generally meaning faster growth, higher yields, less work, more precise control of watering and feeding, fewer diseases, a cleaner operation and better quality produce. On the negative side, initial installation costs are higher and a greater degree of technical skill is required to maximize results.

essential if temperatures are to be lowered during the hot summer months.

Table 6 presents the various types of heating systems used in greenhouse operations in the province. In some cases a grower has more than one heating system.

Watering Systems

The watering of ground beds is usually done by the use of soaker hoses which run parallel to each side of the bed. Bench beds and potted plants are usually watered with the use of chapin tubes. Other operations may use water supply pipes along with garden hoses.

Supplementary Lighting

Very few greenhouses have supplementary lighting. Those that do, make use of ordinary lamps, usually five to six feet apart. Supplementary lighting is mostly used for producing chrysanthemums.

TABLE 6

HEATING SYSTEMS IN ALBERTA

	System	Number of Growers		System	Number of Growers
1.	Gas Furnace	121	8.	Infrared	2
2.	Steam	65	9.	Oil Furnace	2
3.	Hot Water	29	10.	Electric	2
4.	Coal	8	11.	Waste Heat	2
5.	Propane	6	12.	Kerosene	1
6.	Wood	6	13.	Bio-Therm Hot Water)	1
7.	Stove Pipe Heater	5			

Greenhouse Crops

Greenhouses in Alberta produce many kinds of flowers; chrysanthemums, roses, and geraniums being the most common potted plants. Outdoor flowers such as petunias and marigolds are also produced in these greenhouses. Some greenhouse operations concentrate on importing tropical plants which are acclimatized to Alberta conditions before resale. The most commonly grown greenhouse vegetables are cucumbers, tomatoes, and lettuce. During the last few years attempts have been made to grow peppers, eggplants, cauliflower, cabbage and Chinese vegetables, as well as other crops.

Table 7 lists the types of crops grown in greenhouses across the province. The only greenhouses growing a single crop are ones producing vegetables, and a few of these also grow bedding plants. Most greenhouses produce a number of greenhouse crops.

Greenhouses surveyed for the 1987 crop year were divided into two groups on the basis of the major crops grown. Twelve greenhouses (43%) produced Long English cucumbers only. The remaining 16 greenhouses (57%) produced bedding plants, potted and cut mums, poinsettias, foliage plants, roses and tomatoes. Greenhouses producing a variety of crops were in operation year round, whereas the vegetable greenhouses were in operation for about 10 months, February through November. Those producing bedding plants were in operation for about five months, February to June.

Greenhouse Production

The only data available indicating the value of greenhouse production in Alberta are the gross sales compiled by Statistics Canada through a survey of the industry. These sales amounted to $15.4 million in 1983, $18.9 million in 1984, $22.6 million in 1985 and $23.7 million in 1986 (Table 4). The number of firms reporting on gross sales decreased to 59 in 1986, from 106 in 1985. Even with a decrease in the number of

TABLE 7

TYPES OF GREENHOUSE CROPS
GROWN IN ALBERTA, 1986

Area	Cucumbers	Tomatoes	Other Veg*	Bedding Plants	Ornamentals Cuts & Pots	Foliage
1. Ft. McMurray	2	2	1	1	0	0
2. Grande Prairie	1	2	1	7	2	3
3. Whitecourt	3	11	1	16	7	7
4. Edmonton	13	17	4	42	27	24
5. Bonnyville	1	1	0	4	2	3
6. Lloydminster	0	0	0	4	3	2
7. Red Deer	7	10	3	26	10	13
8. Calgary	4	5	3	18	14	13
9. Medicine Hat	35	5	1	7	9	2
10. Lethbridge	3	8	1	12	5	2
TOTAL	69	61	15	136	79	69

*Other vegetables include: peppers, eggplants, lettuce, cauliflower, cabbage, and Chinese vegetables.

firms reporting in 1986, gross sales increaseed. This could be attributed to a higher percentage of large greenhouse operators responding to the questionnaire because they realize it is to their advantage to know the size of, and trends in, the Alberta greenhouse industry. Gross sales of greenhouse products in Alberta are estimated to be over $35 million. During the last few years, some greenhouse operations have diversified and produce more than one crop at the same time.

Marketing of Greenhouse Produce

Greenhouse operators surveyed for the 1987 crop year used several channels to market their produce. The most important of these were

retail facilities owned by greenhouse operators, either attached to the greenhouses or located in an urban area; other retail and wholesale facilities; the Co-op at Redcliff; and farmers' markets in various centers.

Fifty seven percent (16) of the greenhouse operators studied for the 1987 crop year produced flowers (roses, mums, and poinsettias), bedding plants, foliage plants, and selected vegetables. Many of these operators owned retailing facilities attached to the greenhouse or located in shopping centres. These facilities handled a large percentage of the produce and the remaining was shipped to wholesalers and retailers. A few greenhouse operators from this group marketed some of their produce at the gate, with the balance sold to wholesalers and retailers.

Forty-three percent (12) of the greenhouses studied produced Long English cucumbers only. These greenhouse operators were located in Redcliff, Medicine Hat, and Lacombe. They marketed the vast majority of their produce through the Red Hat Co-op at Redcliff[1] and the Sunfresh Co-op in Edmonton. They paid a commission, or fee, set by the Board of Directors of the Co-op to cover grading, packaging, storage, marketing and administration costs.

In north-central Alberta, greenhouses producing vegetables and bedding plants sold a large percentage of their produce at the gate and through rented stalls and booths in shopping centres and at farmers' markets. Farmers' markets have become popular marketing outlets, especially during the bedding plant season.

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1 Red Hat Co-op is a producer organization responsible for the marketing of cucumbers grown in greenhouses in and around Medicine Hat.

Section III

GREENHOUSE PRODUCTION COSTS AND RETURNS

Computation of Individual Cost Components

Interest on Investment

Interest is defined as a sum paid or calculated for the use of capital. The sum is usually expressed in terms of a rate or percentage of the capital involved, called the interest rate.

Interest is charged for the use of investment capital. Had the capital not been invested to buy a specific asset, it could have been used elsewhere, either within or outside the firm, and would have brought some additional return to the firm.

A flat rate of 10 percent was used for the purposes of this study to determine a fair return to land, building and equipment investment. Interest on operating capital was the actual rate of interest paid by the study participants.

Depreciation

Depreciation is defined as the loss in value of an asset over time, mainly as a result of obsolescence. In the case of buildings and equipment, it is that portion of the decrease in value resulting from the passage of time. Obviously, part of the reduced value of the buildings and equipment is the result of usage and is considered a variable cost. The entire depreciation is considered a fixed cost.

In computing depreciation, a 10 percent allowance or salvage value is taken from the purchase price of the buildings and equipment. The following formula was used in arriving at depreciation for buildings and equipment.

$$\text{Depreciation} = \frac{\text{Purchase Price - Salvage Value}}{\text{Number of Years of Life}}$$

Land Value

Land associated with each greenhouse operation was valued at $1,700 per acre, irrespective of its location. This value was determined through real estate values for good farmland suitable for a greenhouse operation. It can be argued that the allocation of such a value distorts the cost of land in and around urban areas relative to farmland. However, for uniformity and reasonable cost estimates, it was decided to standardize the land value regardless of its location. Researchers are aware that land values in cities or towns are much higher than $1,700 per acre, but if market values were used for land acquired ten years ago, it would lead to artificially high fixed costs that would greatly inflate overall production costs. Most of the greenhouse operators surveyed have been in business for quite some time, with the exception of a few who got started within the last eight years or so.

Property and Business Taxes

Taxes on real estate include payments made on the assessed value of the greenhouse operation less any assessment for the greenhouse operator's residence or operations other than the greenhouse. There is a business tax on greenhouses located in urban municipalities. Exact amounts of property and business taxes were included in the costs.

Labour Costs

Hired labour costs included the amount of wages paid and any benefits received by the hired workers, such as contributions to Workers' Compensation, Canada Pension Plan, and Unemployment Insurance.

The hours spent by the operator and his/her family in greenhouse production were estimated. An operator's labour was valued $7.50 per hour, and family labour was valued at either the rate paid to hired labour or the actual amount paid to family members.

Production Materials and Supplies

Production materials and supplies included the purchase of cuttings, seed plants, fertilizers, chemicals, soils, vermiculite, perlite, peat moss, straw, peat pots, and plastic. Costs of production materials and supplies were the actual figures provided by the study participants.

Heating Costs

Almost all greenhouse operators had reasonably accurate costs for heating the greenhouses with natural gas. Monthly bills were helpful in arriving at the total heating costs.

Utility Costs

Utility costs included electricity, telephone, and water. Where the utility bill was combined with the greenhouse operator's residence, the operator was asked to apportion the bill to arrive at total utility costs for the greenhouse operation.

Transportation Expenses

Expenses for trucks or other vehicles owned by greenhouse operators were apportioned according to their use in the greenhouse operation, and personal and leisure driving. Freight charges paid to commercial or private carriers for hauling greenhouse produce or supplies were included in the transportation expenses.

Maintenance Costs

Maintenance costs included repairs to greenhouse structures, boilers, heating equipment, tractors, and all other machinery and equipment associated with the greenhouse operation.

Miscellaneous Costs

These costs include legal and accounting fees, office supplies, bad debts, donations, membership fees, insurance costs, and other costs incurred in a greenhouse operation but not reported under any other heading.

Marketing Charges

Marketing charges were the actual amount paid by each greenhouse operator for having produce marketed through the Redcliff and Edmonton Co-ops. These charges covered grading, packaging, marketing, and administrative fees. The charges paid by each grower were included as a cost item in the study.

Greenhouse Investment Costs by Regions

Greenhouse investment costs for the 1987 crop year were obtained directly from study participants during the survey. Each operator was asked to value the greenhouse structure based on the current market costs of replacement. Study participants were also asked to provide an estimate of the life of the structure in order to calculate interest and depreciation costs.

Investment costs were calculated on land, buildings, machinery, automotives and other miscellaneous equipment. The rate of interest used for determining interest costs for land, buildings, and equipment was 10 percent. Details on average investment and investment costs for the greenhouses in Group I, Group II, and the entire study sample are given in Table 8.

Land Investment

The average land area associated with the greenhouses, such as building (production area and office) and parking space, was 4.79 acres for Group I participants, 2.05 acres for Group II participants, and 3.13 acres for the study sample. Average land investments per greenhouse in Group I, Group II, and the study sample were $8,146, $3,482, and $5,314, respectively. Land investment costs (land interest) for each greenhouse averaged $0.02, and $0.01 per square foot for Group I, Group II, and the study sample, respectively.

Building Investment

The average building investment based on the replacement value of the greenhouse facilities studied during the 1987 crop year was $376,040 per greenhouse in Group I, $169,668 per greenhouse in Group II, and $250,743 per greenhouse for the study sample. Average investment costs (interest and depreciation) on buildings were $44,759, $19,004, and $29,122 per greenhouse for Group I, Group II, and the study sample, respectively. The corresponding investment costs per square foot of greenhouse were $1.01, $0.52 and $0.74, respectively.

Equipment Investment

The average machinery investment based on the purchase price of the equipment was $63,891 per greenhouse for Group I, $95,922 for Group II, and $83,339 for the study sample. Average investment costs for machinery and equipment were $0.19, $0.33, and $0.27 per square foot for Group I, Group II, and the study sample, respectively. Details on investment and investment costs i.e., interest and depreciation on machinery and equipment are presented in Table 8.

TABLE 8

AVERAGE INVESTMENT AND INVESTMENT COSTS FOR THE GREENHOUSES SURVEYED, 1987

	Group I	Group II	Study Sample
Number Surveyed	11	17	28
Land Area (acres)	4.79	2.05	3.13
Land Value ($)	8,146.09	3,482.00	5,314.32
Land Interest ($)	814.61	348.20	531.43
Land Interest ($/sq ft)	0.02	0.01	0.01
Building Area (sq ft)	44,243	36,288	39,413
Building Investment ($)	376,040.50	169,667.62	250,742.69
Building Interest ($)	37,604.04	16,966.76	25,074.27
Building Depreciation ($)	7,155.34	2,037.20	4,047.90
Avg Building Interest & Deprec ($/sq ft)	1.01	0.52	0.74
Equipment Investment ($)	63,891.45	95,922.06	83,338.62
Equipment Interest ($)	6,389.14	9,592.21	8,333.86
Equipment Depreciation ($)	2,027.34	2,279.01	2,180.14
Avg Equip Interest & Deprec ($/sq ft)	0.19	0.33	0.27
Automotive Investment ($)	9,552.00	13,241.59	11,792.11
Automotive Interest ($)	955.20	1,324.16	1,179.21
Automotive Depreciation ($)	386.07	462.06	432.21
Avg Auto Interest & Deprec ($/sq ft)	0.03	0.05	0.04
Average Investment ($)	457,630.06	282,313.12	351,187.62
Average Investment ($/sq ft)	10.34	7.78	8.91
Average Investment Costs ($)	55,331.73	33,009.59	41,778.96
Average Investment Costs ($/sq ft)	1.24	0.91	1.06

Group I represents north and north-central regions (3,4,5 and 6).
Group II represents south and south-central regions (1 and 2).

Automotive Investment

The average investment in automobiles was $9,552 per greenhouse for participants in Group I, $13,242 for Group II, and $11,792 for the study sample. The average investment costs for automotives amounted to $0.4 per square foot for the study sample.

Total Investment and Investment Costs

The average investment per greenhouse for participants in north and north-central Alberta (Group I) was $457,630, compared to $282,313 per greenhouse for the participants in south and south-central Alberta (Group II). The average investment for the study sample was $351,188 per greenhouse. The average investment per square foot of greenhouse area was $1.24, $0.91, and $1.06, for Group I, Group II, and the study sample, respectively. Details on average investment and investment costs are provided in Table 8.

Average investment costs per greenhouse were $55,332 for Group I, $33,010 for Group II, and $41,779 for the study sample. Average investment costs per square foot ranged from $7.78 for Group II to $10.34 for greenhouse operators in Group I and $8.91 for the study sample.

Greenhouse Operating Costs by Regions

Greenhouse operating costs include all costs incurred during the production of greenhouse crops. Some of the most common operating costs are hired labour, material inputs (seed, chemicals, and fertilizers), containers, greenhouse fuel, repairs, maintenance, power, water, property taxes and purchase of supplies. Average operating costs incurred in greenhouses, by region, in 1987 are provided in Table 9. The highest operating cost item was for hired labour at $79,783 for Group I, $44,187 for Group II and $58,171 for the study sample. The second highest cost item was material inputs which amounted to $49,474 for Group I versus $35,162 for Group II; the average for the study sample was $40,785 per greenhouse. Fuel costs for heating the

TABLE 9

AVERAGE GREENHOUSE OPERATING COSTS FOR THE GREENHOUSES SURVEYED, 1987

	Group I	Group II	Study Sample
Number Surveyed	11	17	28
Greenhouse Area (sq ft)	44,243	36,288	39,413
	- - - - - - - dollars - - - - - - -		
Gross Revenue	386,618.69	244,151.56	300,120.81
Growing Media & Seed/Cuttings	43,285.91	26,452.76	33,065.79
Fertilizer and Chemicals	6,187.73	8,709.64	7,718.89
Containers, Labels & Tags	16,555.82	5,431.88	9,802.00
Hired Labour	79,783.44	44,187.29	58,171.50
Greenhouse Fuel	29,230.73	22,888.88	25,380.32
Utilities[1]	10,004.09	5,942.82	7,538.32
Insurance & Registration Fees[2]	5,177.36	2,523.53	3,566.11
Repairs & Maintenance[3]	13,898.73	13,254.12	13,507.36
Freight Leasing & Express	6,165.18	6,228.76	6,203.79
Property Taxes	2,132.91	3,102.18	2,721.39
Business Taxes	103.36	30.00	58.82
Office Supplies	1,140.27	1,027.41	1,071.75
Advertising	10,972.18	1,819.82	5,415.39
Accounting & Legal	2,196.09	1,941.76	2,041.68
Marketing Costs[4]	7,890.00	11,657.12	10,177.18
Travel, Donations, Memberships	1,741.36	2,594.82	2,259.54
Miscellaneous[5]	2,252.09	4,195.12	3,431.79
Interest on Operating Capital	13,335.00	11,014.76	11,926.29
Average Operating Costs Per Greenhouse	252,052.25	173,002.69	204,057.87
Average Operating Costs per Sq. Ft.	5.70	4.77	5.18

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

greenhouses were $29,231 Group I, 1.3 times those of Group II ($22,889). The average greenhouse fuel cost for the study sample was $25,380.

Greenhouses in north and north-central Alberta (Group I) reported average operating costs of $252,052 per greenhouse versus $173,003 in south and south-central Alberta (Group II). Average operating costs for the study sample amounted to $204,058 (Table 9). Average operating costs per square foot of greenhouse area for Group I, Group II, and the study sample were $5.70, $4.77, and $5.18, respectively.

Production Costs and Returns by Regions

The results presented in Tables 9 and 10 show that the major costs in greenhouse operations were labour (hired, operator, and family), followed by material inputs, greenhouse fuel, and repairs and maintenance.

Production costs related to the above were 32 percent, 18 percent, 9 percent, and 5 percent, respectively. Average fuel and utility costs per greenhouse operation were 12 percent of total operating costs for both greenhouse groups.

Production costs for the typical greenhouse surveyed for the 1987 crop year amounted to $275,033 or $6.98 per square foot. For greenhouses in north and north-central Alberta (Group I), they were $338,831 compared with $233,753 for greenhouses in south and south-central Alberta (Group II). The corresponding average production costs per square foot were $7.66 and $6.44, respectively.

The average gross revenue per greenhouse in 1987 for the study sample was $300,121, or $8.7408 per square foot. For Group I, average gross revenue was $386.619, or $9.69 per square foot, versus $244,152 or $6.73 per square foot for Group II.

The average return over operating costs was positive for both groups of growers and the study sample, at $3.99 for Group I, $1.96 for Group II, and $2.44 for the study sample.

The average return to management was positive for both groups of growers. Return to management was $1.08 per square foot for Group I, $0.29 for Group II, and $0.64 for the study sample. Details on costs and returns by region and the study sample are presented in Table 10.

Investment Costs For Greenhouses Producing Cucumbers

The study sample was divided into two main categories according to the type of crop produced. There were 19 greenhouse operations producing mainly cucumbers and the remaining nine operations produced bedding plants and other floricultural crops, with bedding plants being the major enterprise.

Cucumber producing greenhouses were further divided into two groups according to the type of growing media used. Twelve greenhouses used soil and the other seven used either pots or peatmoss bags. The main reason for using pots was infestation of the soil by nematodes.

The average land area associated with the group of greenhouses producing cucumbers in soil and pots was 1.54 and 1.16 acres respectively.

The average greenhouse area for cucumbers produced in soil and in pots was 25,083 square feet, and 15,319 square feet, respectively. The average area for both groups combined was 21,486 square feet.

TABLE 10

COMPARISON OF COSTS AND RETURNS BETWEEN GROUP I, GROUP II, AND THE STUDY SAMPLE, 1987

	Group I	Group II	Study Sample
Number Surveyed	11	17	28
Greenhouse Area (sq ft)	44,243	36,288	39,413
	- - - - - - - dollars - - - - - - -		
Gross Revenue	386,618.69	244,151.56	300,120.81
Gross Revenue Per Sq. Ft.	8.74	6.73	7.61
Material Inputs	66,029.46	40,594.28	50,586.68
Hired Labour	79,783.44	44,187.29	58,171.50
Greenhouse Fuel	29,230.73	22,888.88	25,380.32
Utilities	10,004.09	5,942.82	7,538.32
Insurance & Registration Fees	5,177.36	2,523.53	3,566.11
Repairs & Maintenance	13,898.73	13,254.12	13,507.36
Freight Leasing and Express	6,165.18	6,228.76	6,203.79
Taxes	2,236.27	3,132.18	2,780.21
Advertising	10,972.18	1,819.82	5,415.39
Accounting & Legal	2,196.09	1,941.76	2,041.68
Marketing Costs	7,890.00	11,657.12	10,177.18
Miscellaneous[1]	5,133.72	7,817.35	6,763.08
Interest on Operating Capital	13,335.00	11,014.76	11,926.29
Total Operating Costs	252,052.25	173,002.69	204,057.87
Land, Buildings & Equipment Interest	45,762.99	28,231.32	35,118.76
Depreciation	9,568.52	4,778.19	6,660.09
Operator Labour	31,447.18	27,740.70	29,196.82
Total Other Costs	86,778.69	60,750.21	70,975.67
Total Production Costs	338,830.62	233,752.62	275,033.19
Total Production Costs Per Sq. Ft.	7.66	6.44	6.98
Return Over Operating Costs	134,566.44	71,148.87	96,062.87
Return Over Operating Costs Per Sq. Ft.	3.04	1.96	2.44
Return to Management	47,787.84	10,398.69	25,087.29
Return to Management Per Sq. Ft.	1.08	0.29	0.64

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

The average building, equipment, and automotive investment was $194,562 per greenhouse for cucumbers produced in soil, and $101,169 per greenhouse for cucumbers produced in pots. The average investment for both groups of cucumbers was $160,154 per greenhouse, or $7.45 per square foot. Details on average investment and investment costs for greenhouses using different growing media to produce cucumbers are given in Table 11.

Operating Costs For Greenhouses Producing Cucumbers

Greenhouses producing cucumbers were divided into two groups according to the type of growing media used, soil or pots. A comparison of operating costs for both growing media is presented in Table 12 along with the averages for both groups. Marketing was the largest cost item for greenhouses using soil, followed by greenhouse fuel and hired labour. Cucumbers grown in pots and bags showed considerably higher material input costs when compared with cucumbers grown in soil. Greenhouse fuel was the leading cost item for cucumbers grown in pots, followed by marketing costs, and hired labour. Combined operating costs for both groups (soil and pots) showed marketing costs as the major expenditure, followed by greenhouse fuel, hired labour and interest on operating capital.

Average operating costs per greenhouse were $84,558 or $3.37 per square foot for producing cucumbers in soil, $35,594 or $2.82 per square foot for producing cucumbers in pots. The average operating costs for both groups combined amounted to $66,519 or $3.10 per square foot. Details on individual operating cost items are given in Table 12.

Production Costs and Returns For Greenhouses Producing Cucumbers

The average gross revenue for greenhouse operators using soil to produce cucumbers was $128,309 in 1987. Gross revenue per square foot of greenhouse area was $5.12. For operations using pots to produce cucumbers, average gross revenue per greenhouse amounted to $59,532

TABLE 11

COMPARISON OF INVESTMENT AND INVESTMENT COSTS
FOR GREENHOUSES PRODUCING CUCUMBERS, 1987

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil & Pots)
Number Surveyed	12	7	19
Land Area (acres)	1.54	1.16	1.40
Land Value ($)	2,613.75	1,974.43	2,378.21
Land Interest ($)	261.37	197.44	237.82
Land Interest ($/sq ft)	0.01	0.01	0.01
Building Area (sq ft)	25,083	15,319	21,486
Building Investment ($)	124,010.00	66,286.69	102,743.50
Building Interest ($)	12,401.00	6,628.67	10,274.35
Building Depreciation ($)	1,632.98	937.29	1,376.67
Avg Building Interest & Deprec ($/sq ft)	0.56	0.49	0.54
Equipment Investment ($)	60,171.66	27,568.00	48,159.79
Equipment Interest ($)	6,017.16	2,756.80	4,815.98
Equipment Depreciation ($)	1,663.16	820.08	1,352.55
Avg Equip Interest & Deprec ($/sq ft)	0.31	0.23	0.29
Automotive Investment ($)	7,767.25	5,340.00	6,873.00
Automotive Interest ($)	776.72	534.00	687.30
Automotive Depreciation ($)	306.17	186.24	261.98
Avg Auto Interest & Deprec ($/sq ft)	0.04	0.05	0.04
Average Investment ($)	194,562.50	101,169.06	160,154.25
Average Investment ($/sq ft)	7.76	6.60	7.45
Average Investment Costs ($)	23,058.55	12,060.50	19,006.64
Average Investment Costs ($/sq ft)	0.92	0.79	0.88

TABLE 12

COMPARISON OF OPERATING COSTS
FOR GREENHOUSES PRODUCING CUCUMBERS, 1987

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil & Pots)
Number Surveyed	12	7	19
Greenhouse Area (sq ft)	25,083	15,319	21,485
	- - - - - - - - dollars - - - - - - - -		
Gross Revenue	128,309.12	59,532.14	102,970.25
Growing Media & Seed/Cuttings	4,280.00	2,256.71	3,534.58
Fertilizer and Chemicals	5,021.83	2,070.00	3,934.32
Containers, Labels & Tags	785.08	531.14	691.53
Hired Labour	12,253.91	3,911.29	9,180.31
Greenhouse Fuel	14,521.83	7,615.14	11,977.26
Utilities[1]	3,438.33	2,539.00	3,107.00
Insurance & Registration Fees[2]	2,567.33	1,251.71	2,082.63
Repairs & Maintenance[3]	6,632.25	2,291.43	5,033.00
Freight Leasing & Express	516.67	197.00	398.89
Property Taxes	1,884.58	1,900.86	1,890.58
Business Taxes	17.38	20.00	18.34
Office Supplies	427.17	92.43	303.84
Advertising	160.42	114.00	143.32
Accounting & Legal	800.67	560.43	712.16
Marketing Costs[4]	17,001.33	6,817.00	13,249.21
Travel, Donations, Memberships	598.83	319.14	495.79
Miscellaneous[5]	2,154.00	576.14	1,572.68
Interest on Operating Capital	11,496.58	2,531.00	8,193.47
Average Operating Costs Per Greenhouse	84,558.19	35,594.43	66,518.87
Average Operating Costs per Sq. Ft.	3.37	2.32	3.10

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

or $3.89 per square foot. Average gross revenue for both groups combined was $102,970 or $4.79 per square foot.

Average production costs for cucumbers grown in soil were $129,356 per greenhouse, or $5.16 per square foot of the greenhouse area. For cucumbers grown in pots, average production costs per greenhouse in 1987 amounted to $64,467 or $4.21 per square foot.

The average return over operating costs was relatively higher for greenhouses producing cucumbers in soil compared with greenhouses using pots. The average return of the soil group was $43,751 per greenhouse or $1.74 per square foot compared to $23,938 ($1.56 per square foot) for the pots group. Returns over operating costs for both groups combined amounted to $36,451 per greenhouse or $1.70 per square foot. However, return to management was negative for the soil group (-$0.04) per square foot). For cucumbers produced in pots, the return to management was negative by $0.32 per square foot. The return to management for the groups combined was negative by $0.12 per square foot.

The major costs for greenhouses producing cucumbers resulted from marketing, greenhouse fuel, hired labour, and interest paid on operating capital. Table 13 provides a breakdown of these investment and operating costs.

Greenhouse Investment Costs By Crops Produced

The study sample was divided into two categories according to the types of crops produced. All of the greenhouse operations (28) reported the production of both cucumbers and tomatoes. Twenty reported the production of mums, roses, bedding plants, foliage plants or poinsettias, and in some cases produced two or more these crops.

TABLE 13

COMPARISON OF COSTS AND RETURNS
FOR GREENHOUSES PRODUCING CUCUMBERS, 1987

	Cucumbers (Soil)	Cucumbers (Pots)	Cucumbers (Soil & Pots)
Number Surveyed	12	7	19
Greenhouse area (sq ft)	25,083	15,319	21,486
	- - - - - - - - dollars - - - - - - - -		
Gross Revenue	128,309.12	59,532.14	102,970.25
Gross Revenue Per Sq. Ft.	5.12	3.89	4.79
Material Inputs	10,086.91	4,857.85	8,160.43
Hired Labour	12,253.91	3,911.29	9,180.31
Greenhouse Fuel	14,521.83	7,615.14	11,977.26
Utilities	3,438.33	2,539.00	3,107.00
Insurance & Registration Fees	2,567.33	1,251.71	2,082.63
Repairs & Maintenance	6,632.25	2,291.43	5,033.00
Freight Leasing and Express	516.67	197.00	398.89
Taxes	1,901.96	1,920.86	1,908.92
Advertising	160.42	114.00	143.32
Accounting & Legal	800.67	560.43	712.16
Marketing Costs	17,001.33	6,817.00	13,249.21
Miscellaneous[1]	3,180.00	987.71	2,372.31
Interest on Operating Capital	11,496.58	2,531.00	8,193.47
Total Operating Costs	84,558.19	35,594.43	66,518.87
Land, Buildings & Equipment	19,456.25	10,116.90	16,015.44
Depreciation	3,602.20	1,943.41	2,991.07
Operator Labour	21,739.33	16,812.00	19,924.00
Total Other Costs	44,797.78	28,872.31	38,930.51
Total Production Costs	129,355.81	64,466.72	105,449.25
Total Production Costs Per Sq. Ft.	5.16	4.21	4.91
Return Over Operating Costs	43,750.96	23,937.71	36,451.34
Return Over Operating Costs Per Sq. Ft.	1.74	1.56	1.70
Return to Management	(1,046.81)	(4,934.59)	(2,479.15)
Return to Management Per Sq. Ft.	(0.04)	(0.32)	(0.12)

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

The average land area associated with the group of greenhouses producing vegetables was 1.22 acres, with 2.52 acres for other crops group. Average greenhouse area for the vegetables group was 18,177 square feet compared with 31,192 square feet for the other crops group.

Average building, equipment, and automotive investment amounted to $135,316 per greenhouse operation or $7.44 per square foot for the vegetables group. Average investment per operation for the other crops group was $303,613 ($9.73 per square foot). In 1987 average investment costs for buildings, equipment, and automotives were estimated at $16,129 or $0.89 per square foot for the vegetables group, and $36,133 or $1.16 per square foot for the other crops group. Details on average investment and investment costs by the types of crops produced are presented in Table 14.

Greenhouse Operating Costs by Crops Produced

Greenhouse fuel was the highest operating cost item for the greenhouses producing vegetables. This was followed by marketing costs and labour. Major operating cost items for greenhouses producing other crops were hired labour, growing media, greenhouse fuel and repairs and maintenance.

Average operating costs for greenhouses producing vegetables were $56,925 ($3.13 per square foot), and $205,190.30 ($6.58 per square foot) for the other crops group. Details of operating costs for the two crop groups are provided in Table 15.

Greenhouse Production Costs And Returns By Crops Produced

The average gross revenue for greenhouse operations producing vegetables was $84,859 per operation in 1987. Gross revenue per square foot of the greenhouse area was $4.67. Average gross revenue for greenhouse operations producing other crops was $292,346 or $9.37 per square foot.

TABLE 14

COMPARISON OF INVESTMENT AND INVESTMENT COSTS BETWEEN GREENHOUSES PRODUCING VEGETABLES AND OTHER CROPS, 1987

	Vegetables[1]	Other Crops[2]
Number Surveyed	28	20
Land Area (acres)	1.22	2.52
Land Value ($)	2,067.81	4,289.27
Land Interest ($)	206.78	428.93
Land Interest ($/sq ft)	0.01	0.01
Building Area (sq ft)	18,177	31,192
Building Investment ($)	88,728.56	229,158.44
Building Interest ($)	8,872.86	22,915.83
Building Depreciation ($)	1,265.56	4,022.36
Avg Building Interest & Deprec ($/sq ft)	0.56	0.86
Equipment Investment ($)	39,003.82	61,549.75
Equipment Interest ($)	3,900.37	6,154.96
Equipment Depreciation ($)	1,119.06	1,428.28
Avg Equip Interest & Deprec ($/sq ft)	0.28	0.24
Automotive Investment ($)	5,516.25	8,615.40
Automotive Interest ($)	551.62	861.54
Automotive Depreciation ($)	212.98	301.28
Avg Auto Interest & Deprec ($/sq ft)	0.04	0.04
Average Investment ($)	135,316.12	303,612.56
Average Investment ($/sq ft)	7.44	9.73
Average Investment Costs ($)	16,129.24	36,113.18
Average Investment Costs ($/sq ft)	0.89	1.16

1 Cucumbers and tomatoes.

2 Bedding plants, foliage plants, mums, poinsettias, roses, etc.

TABLE 15

COMPARISON OF OPERATING COSTS BETWEEN GREENHOUSES PRODUCING VEGETABLES AND OTHER CROPS, 1987

	Vegetables[1]	Other Crops[2]
Number Surveyed	28	20
Greenhouse Area (sq ft)	18,177	31,192
	- - - - - - - dollars - - - - - - -	
Gross Revenue	84,859.31	292,346.00
Growing Media & Seed/Cuttings	2,857.61	42,081.60
Fertilizer and Chemicals	3,241.29	6,233.65
Containers, Labels & Tags	899.96	11,959.85
Hired Labour	9,233.61	69,624.69
Greenhouse Fuel	10,076.61	20,825.20
Utilities[1]	3,122.54	6,092.10
Insurance & Registration Fees[2]	1,671.75	3,131.25
Repairs & Maintenance[3]	4,480.46	12,351.25
Freight Leasing & Express	414.75	8,102.40
Property Taxes	1,430.07	1,460.85
Business Taxes	23.39	45.15
Office Supplies	267.07	1,112.05
Advertising	433.82	6,726.70
Accounting & Legal	658.96	1,735.60
Marketing Costs[4]	9,851.82	455.50
Travel, Donations, Memberships	487.89	2,430.35
Miscellaneous[5]	1,175.86	3,361.75
Interest on Operating Capital	6,597.89	7,459.75
Average Operating Costs Per Greenhouse	56,925.32	205,189.69
Average Operating Costs per Sq. Ft.	3.13	6.58

1 Cucumbers and tomatoes.
2 Bedding plants, foliage plants, mums, poinsettias, roses, etc.
3 Includes power, water, telegram and telephone.
4 Includes motor vehicles, greenhouse and labour insurance.
5 Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.
6 Includes commission and other marketing costs.
7 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

Average production costs for the vegetable producing group was $89,114 per operation, or $4.90 per square foot. The costs for the other crops group amounted to $257,361 ($8.25 per square foot). The average return over operating costs per square foot was considerably higher for the other crops group,as compared with the group producing vegetables. Returns over operating costs for other crops were $87,156 ($2.79 per square foot) per greenhouse operation versus $27,934 ($1.54 per square foot) for vegetables. Average return to management was positive at $1.12 per square foot for other crops operations, and negative by $0.23 per square foot for greenhouses producing vegetables.

The most significant cost items for the other crops operations were hired labour, material inputs, operator and family labour, greenhouse fuel, freight, and repairs and maintenance. The leading costs for greenhouse operations producing cucumbers and tomatoes were operator and family labour, greenhouse fuel, marketing, hired labour, and interest on operating capital. A breakdown of all operating and investment costs for the greenhouses classified according to crops is presented in Table 16.

TABLE 16

COMPARISON OF COSTS AND RETURNS BETWEEN GREENHOUSES PRODUCING VEGETABLES AND OTHER CROPS, 1987

	Vegetables[1]	Other Crops[2]
Number Surveyed	28	20
Greenhouse Area (sq ft)	18,177	31,192
	- - - - - - dollars - - - - - -	
Gross Revenue	84,859.31	292,346.00
Gross Revenue Per Sq. Ft.	4.67	9.37
Material Inputs	6,098.90	48,314.25
Containers, Labels and Tags	899.96	11,959.85
Hired Labour	9,233.61	69,624.69
Greenhouse Fuel	10,076.61	20,825.20
Utilities	3,122.54	6,092.10
Insurance & Registration Fees	1,671.75	3,131.25
Repairs & Maintenance	4,480.46	12,351.25
Freight Leasing and Express	414.75	8,102.40
Taxes	1,453.46	1,506.00
Advertising	433.82	6,726.70
Accounting & Legal	658.96	1,735.60
Marketing Costs	9,851.82	455.50
Miscellaneous[3]	1,930.82	6,904.15
Interest on Operating Capital	6,597.89	7,459.75
Total Operating Costs	56,925.32	205,189.69
Land, Buildings & Equipment	13,531.63	30,361.26
Depreciation	2,597.43	5,751.69
Operator Labour	16,060.25	16,058.35
Total Other Costs	32,189.31	52,171.30
Total Production Costs	89,114.44	257,360.56
Total Production Costs Per Sq. Ft.	4.90	8.25
Return Over Operating Costs	27,934.00	87,156.31
Return Over Operating Costs Per Sq. Ft.	1.54	2.79
Return to Management	(4,225.30)	34,985.04
Return to Management Per Sq. Ft.	(0.23)	1.12

1 Cucumbers and tomatoes.
2 Bedding plants, foliage plants, mums, poinsettias, roses, etc.
3 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

SECTION IV

GREENHOUSE PRODUCTION COSTS AND RETURNS BY SIZE OF OPERATION

Investment Costs By Size of Greenhouse Operation

The study sample was further divided into three groups according to the size of the operation. Eight operations were placed in a group for which the greenhouse area was up to 19,999 square feet; 13 in the 20,000 to 44,999 square foot range; and the rest (7) were placed in the 45,000 square feet and over category. The average greenhouse area for the smallest class of operation was 16,554 square feet; for the intermediate size of operation 29,878 square feet; and 83,246 square feet for the large operations.

The average land area associated with a greenhouse operation was 1.47 acres for the up to 19,999 square feet group, 2.27 acres for greenhouses in the 20,000 to 44,999 square feet category, and 6.61 acres for those with an area of more than 45,000 square feet.

The average building and equipment investment costs were $0.88 per square foot for the smallest class of operations (up to 19,999 square feet), and $0.74 and $1.20 per square foot for the intermediate and large size of operations, respectively. Average investment for the small group amounted to $129,162 per greenhouse ($7.80 per square foot), for the intermediate group, $202,112 per greenhouse ($6.76 per square foot), and for the largest size group, $881,786 per greenhouse ($10.59 per square foot). Average investment costs per operation were $15,690 or $0.95 per square foot for those in the up to 19,999 square foot group; $23,573 or $0.81 per square foot for the group in the 20,000 to 44,999 square foot range; and $104,453 or $1.25 per square foot for greenhouses larger than 45,000 square feet. Details on average investment and investment costs by size of operation are presented in Table 17.

TABLE 17

COMPARISON OF INVESTMENT AND INVESTMENT COSTS
BY SIZE OF OPERATION, 1987

	Up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over	Study Sample
Number Surveyed	8	13	7	28
Land Area (Acres)	1.47	2.27	6.61	3.13
Land Value ($)	2,507.50	3,855.08	11,232.13	5,314.32
Land Interest	250.75	385.51	1,123.21	531.43
Land Interest ($/sq ft)	0.02	0.01	0.01	0.01
Building Area (sq ft)	16,554	29,878	83,245	39,413.39
Building Investment ($)	79,568.75	140,084.56	651,878.00	250,742.69
Building Interest ($)	7,956.87	14,008.46	65,187.77	25,074.27
Building Depreciation ($)	1,387.87	1,952.30	10,979.79	4,047.90
Avg Building Int & Deprec ($/sq ft)	0.56	0.53	0.91	0.74
Equipment Investment ($)	41,060.75	48,461.23	196,428.56	83,338.62
Equipment Interest ($)	4,106.07	4,846.12	19,642.86	8,333.86
Equipment Depreciation ($)	1,123.88	1,551.32	4,555.13	2,180.14
Avg Equip Int & Deprec ($/sq ft)	0.32	0.21	0.29	0.27
Automotive Investment ($)	6,024.62	9,711.69	11,147.14	11,792.11
Automotive Interest ($)	602.46	971.17	2,224.71	1,179.21
Automotive Depreciation	261.85	371.38	739.86	432.21
Avg Auto Int & Deprec ($/sq ft)	0.05	0.04	0.04	0.04
Average Investment ($)	129,161.56	202,112.50	881,785.69	351,187.62
Average Investment ($/sq ft)	7.80	6.76	10.59	8.91
Average Investment Costs ($)	15,689.75	24,086.22	104,453.25	41,778.96
Average Investment Costs ($/sq ft)	0.95	0.81	1.25	1.06

Operating Costs by Size of Greenhouse Operation

The average operating costs presented in Table 18 indicate that greenhouse fuel was the largest expense item for the small group of greenhouses. This was followed by marketing costs, hired labour, interest on operating capital, and repairs and maintenance. The average operating costs for the intermediate group were highest for hired labour, followed by greenhouse fuel, growing media and seed/cuttings, and marketing. For the largest group of greenhouses hired labour was the leading cost item, followed by growing media and seed/cuttings, greenhouse fuel and repairs and maintenance. Detailed operating costs for the intermediate and large operations are presented in Table 18.

In 1987, average total operating costs amounted to $63,745 ($3.85 per square foot) for the smallest operations. These costs increased to $90,943 ($3.04 per square foot) for the intermediate sized operations and $574,485 ($6.90 per square foot) for the largest greenhouses.

Production Costs and Returns by Size of Greenhouse Operation

The average total production costs per operation were $98,765 for the greenhouses in the up to 19,999 square foot group, $149,297 for those in the 20,000 to 44,999 square foot category, and $709,993 for the greenhouses over 45,000 square feet.

However, average production costs per square foot were lowest for the intermediate sized operations at $5.00 per square foot compared with $5.97 per square foot for the smallest operations and $8.53 per square foot for the largest ones. The average gross revenue for small operations was $103,539, or $6.25 per square foot. For operations in the 20,000 to 44,999 square foot class, average gross revenue was $154,244, or $5.16 per square foot, compared to $795,700, or $9.56 per square foot in the over 45,000 square feet of area group (Table 19).

Greenhouse operations in the largest size group (45,000 square feet and over) showed the highest return over operating costs at $2.66 per square foot, followed by small size operations (up to 19,999 square feet) and intermediate size groups (20,000 to 44,999 square feet), at $2.40 and $2.12 per square foot, respectively.

The average return to management was positive for all groups of greenhouse operations when studied by size of operation. It ranged from $0.17 per square foot for the intermediate group to $1.03 per square foot in the largest size group. Details on average gross revenue, operating costs, other costs and return over operating costs, as well as return to management as determined by the size of operation are given in Table 19.

Comparison of Costs and Returns Between the Study Sample and Individual Greenhouse Operations

The information presented in Table 20 will be of particular significance to study participants as it provides an opportunity for each greenhouse operator to compare his/her results with those of the study sample. Table 20 lists average costs and returns data for the study sample only, and a column has been left blank for the personal use of the study participant. Study participants each received a personalized report on their 1987 greenhouse operation along with the results of the study sample divided into regions, by type of crop produced, and by size of greenhouse operation.

TABLE 18

COMPARISON OF OPERATING COST
BY SIZE OF OPERATION, 1987

	Up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over	Study Sample
Number Surveyed	8	13	7	28
Greenhouse Area (sq ft)	16,554	29,878	83,246	39,413
	- - - - - - - - - - - dollars - - - - - - - - - - -			
Gross Revenue	103,539.37	154,243.75	795,699.81	300,120.81
Growing Media & Seed/Cuttings	5,171.25	13,081.46	102,059.00	33,065.79
Fertililizer & Chemicals	3,757.25	3,790.00	19,543.00	7,718.89
Containers, Labels & Tags	1,437.25	3,707.69	30,679.71	9,802.00
Hired Labour	7,702.62	16,176.15	193,841.56	58,171.50
Greenhouse Fuel	10,929.12	14,378.23	62,328.43	25,380.32
Utilities[1]	3,867.37	4,708.38	16,989.29	7,538.32
Insurance & Reg Fees[2]	2,246.50	2,393.46	7,252.00	3,566.11
Repairs & Maintenance[3]	5,458.87	6,684.00	35,377.57	13,507.36
Freight, Leasing & Express	703.12	716.92	22,680.14	6,203.79
Property Taxes	1,302.87	2,856.08	4,092.43	2,721.39
Business Taxes	19.38	23.08	170.29	58.82
Office Supplies	218.50	436.31	3,227.00	1,071.75
Advertising	302.00	554.31	20,287.00	5,415.39
Accounting & Legal	696.25	1,349.62	4,864.57	2,041.68
Marketing Costs[4]	10,188.00	11,093.92	8,462.29	10,177.18
Travel, Donations, Memberships	431.25	720.54	7,207.14	2,259.54
Miscellaneous[5]	2,391.12	653.85	9,780.14	3,431.79
Interest on Operating Capital	6,922.37	7,619.38	25,643.57	11,926.29
Average Operating Cost Per Greenhouse	63,745.12	90,943.37	574,485.12	204,057.87
Average Operating Cost Per Sq Ft	3.85	3.04	6.90	5.18

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repairs, maintenance and fuel xxpenses for equipment, buildings and motor tehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotial expenses other than advertising.

TABLE 19

COMPARISON OF COSTS AND RETURNS
BY SIZE OF OPERATION, 1987

	Up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over	Study Sample
Number Surveyed	8	13	7	28
Greenhouse Area (sq ft)	16,554	29,878	83,246	39,413
	- - - - - - - - - - - dollars - - - - - - - - - - -			
Gross Revenue	103,539.37	154,243.75	795,699.81	300,120.81
Gross Revenue Per Sq Ft	6.25	5.16	9.56	7.61
Material Inputs	10,365.75	20,579.15	152,281.71	50,586.68
Hired Labour	7,702,62	16,176.15	193,841.56	58,171.50
Greenhouse Fuel	10,929.12	14,378.23	62,328.43	25,380.32
Utilities	3,867.37	4,708.38	16,989.29	7,538.32
Insurance & Registration Fees	2,246.50	2,393.46	7,252.00	3,566.11
Repairs & Maintenance	5,458.87	6,684.00	35,377.57	13,507.36
Freight Leasing & Express	703.12	716.92	22,680.14	6,203.79
Taxes	1,322.25	2,879.16	4,262.72	2,780.21
Advertising	302.00	554.31	20,287.00	5,415.39
Accounting & Legal	696.25	1,349.62	4,864.57	2,041.68
Marketing Costs	10,188.00	11,093.92	8,462.29	10,177.18
Miscellaneous[1]	3,040.87	1,810.70	20,214.28	6,763.08
Interest on Operating Capital	6,922.37	7,619.38	25,643.57	11,926.29
Total Operating Costs	63,745.12	90,943.37	574,485.12	204,057.87
Land, Building, Equipment Interest	12,916.16	20,211.25	88,178.50	35,118.76
Depreciation	2,773.34	3,873.94	16,274.64	6,660.00
Operator's Labour	19,330.25	34,268.07	31,054.86	29,196.82
Total Other Costs	35,019.74	58,354.25	135,508.00	70,975.67
Total Production Costs	98,764.81	149,297.44	709,992.69	275,033.19
Total Production Costs Per Sq Ft	5.97	5.00	8.53	6.98
Return Over Operating Costs	39,794.25	63,300.38	221,214.69	96,062.87
Return Over Operating Costs Per Sq Ft	2.40	2.12	2.66	2.44
Return to Management	4,744.55	4,946.15	85,706.75	25,087.29
Return to Management Per Sq Ft	0.29	0.17	1.03	0.64

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel, and promotional costs other than advertising.

TABLE 20

COMPARISON OF COSTS AND RETURNS BETWEEN
THE STUDY SAMPLE AND YOUR GREENHOUSE OPERATION

	Study Sample	Your Greenhouse
Number Surveyed	28	
Greenhouse Area (sq ft)	39,413	
	- - - - - dollars - - - - -	
Gross Revenue	300,120.81	
Gross Revenue Per Sq Ft	7.61	
Growing Media & Seed/Cuttings	33,065.79	
Fertilizer & Chemicals	7,718.89	
Containers, Labels & Tags	9,802.00	
Hired Labour	58,171.50	
Greenhouse Fuel	25,380.32	
Utilities	7,538.32	
Insurance & Registration Fees	3,566.11	
Repairs & Maintenance	13,507.36	
Freight Leasing & Express	6,203.79	
Property Taxes	2,721.39	
Business Taxes	58.82	
Office Supplies	1,071.75	
Advertising	5,415.39	
Accounting & Legal	2,041.68	
Marketing Costs	10,177.18	
Travel, Donations, Memberships	2,259.54	
Miscellaneous[1]	3,431.79	
Interest on Operating Capital	11,926.29	
Total Operating Costs	204,057.87	
Land, Building, Equipment Interest	35,118.76	
Depreciation Costs	35,118.76	
Other Costs	35,118.76	
Operator's Labour	29,196.82	
Total Production Costs	275,033.19	
Total Production Costs Per Sq Ft	6.98	
Return Over Operating Costs	96,062.87	
Return Over Operating Costs Per Sq Ft	2.44	
Return to Management	25,087.29	
Return to Management Per Sq Ft	0.64	

1 Includes Small Tools, Shop Supplies, Soil Testing, Donations, Memberships, Travel and Promotional Expenses Other Than Advertising.

SECTION V

COMPARISON BETWEEN 1983-84 AND 1987 GREENHOUSE STUDY RESULTS

This section provides a brief comparison of average costs and returns for the two study years for general information purpose. It is difficult to compare the results of the two study years because of the change in the sample size and crop mix. However, an attempt was made to show how the major input costs and returns have changed over the last few years. Results from the 1987 study year have also been compared with the results from the 1979-1980 and 1982-1983 study years to show the changes in costs and returns over the last several years.

During the 1983-84 survey of the greenhouse industry, 21 greenhouse owners provided detailed information on their operations. In the 1987 survey 28 greenhouse operators were visited to obtain the required information. Some of the growers who participated in the 1983-84 survey were unable to participate in the 1987 survey. Therefore, new participants were selected for replacement, which resulted in changes in the sample size and cropping mix.

The average area for the study sample in 1983-84 was 34,263 square feet. Greenhouse area for the 28 participants in 1987 averaged 39,413 square feet. The average area for Group I and Group II participants during 1987 was 44,243 square feet and 36,288 square feet, respectively. Average gross revenue during 1987 was relatively higher than for the previous survey year. Average production costs and returns were also higher in the 1987 crop year. Table 21 presents a comparison between the two study years for gross revenue and production costs.

TABLE 21

COMPARISON BETWEEN 1983-84 AND 1987 GREENHOUSE STUDY RESULTS

	1983-84 Study Sample	1987 Study Sample
Number Surveyed	21	28
Average Area (sq ft)	34,263	39,413
	- - - - - - - - dollars - - - - - - -	
Gross Revenue	248,602.00	300,120.81
Gross Revenue Per Sq Ft	7.26	7.61
Material Inputs	34,083.81	40,784.68
Containers, Labels & Tags	9,820.52	9,802.00
Hired Labour	55,439.81	58,171.50
Greenhouse Fuel	24,560.91	25,380.32
Utilities	5,029.76	7,538.32
Insurance & Registration Fees	3,098.95	3,566.11
Repairs & Maintenance	15,759.29	13,507.36
Freight, Leasing & Express	5,246.09	6,203.79
Taxes	2,529.19	2,780.21
Advertising	1,398.33	5,415.39
Accounting & Legal	1,794.90	2,041.68
Marketing Costs	6,112.14	10,177.18
Miscellaneous[1]	6,811.38	6,763.08
Interest on Operating Capital	11,037.57	11,926.29
Total Operating Costs	182,662.12	204,057.87
Land, Building, Equipment Interest	28,918.54	35,118.76
Depreciation	7,751.25	6,660.09
Operator Labour	36,402.71	29,196.82
Total Other Costs	73,072.25	70,975.67
Total Production Costs	255,734.81	275,033.19
Total Production Costs Per Sq Ft	7.46	6.98
Return Over Operating Costs	65,939.19	96,062.87
Return Over Operating Costs Per Sq Ft	1.92	2.44
Return to Management	(7,133.20)	25,087.29
Return to Management Per Sq Ft	(0.21)	0.64

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

In 1987, average gross revenue for the study sample showed an increase over the 1983-84 crop year. Gross revenue for the study sample in 1987 amounted to $7.61 per square foot, versus $7.26 per square foot during the 1983-84 crop year. Conversely, total production costs decreased in the 1987 crop year compared with 1983-84, from $7.46 to $6.98 per square foot.

Details regarding size of the sample, gross revenue, average operating costs, and return to management for the 1983-84 and 1987 survey years are presented in Table 21.

Figures 4 and 5 show the distribution of various cost components for the survey years 1979-80, 1982-83, 1983-84, and 1987. Material inputs (seed, cuttings, growing media, fertilizer, chemicals, containers, labels, and tags) increased from 17 percent in 1983-84 to 19 percent in 1987. Labour costs (hired and operator) showed a decrease of 4 percent between the years 1983-84 and 1987.

Greenhouse fuel (heating) costs were about 10 percent of overall production costs during 1982-83 and 1983-84, and 9 percent during the 1987 survey year. The Primary Producer's Energy Rebate Program did offset a significant part of the greenhouse heating costs and most of the greenhouse operators were quite pleased with the program. Numerous greenhouse owners were concerned that if this program was withdrawn, they would not be able to keep their facilities in production during the winter months because of high heating costs.

Interest costs (operating and investment) rose from 14 to 17 percent during the comparison period (1983-84 to 1987). These costs were considerably higher during the 1979-80 survey year when high interest rates pushed these costs up toward 22 percent of total production expenditures.

FIGURE 4:
COMPARISON OF GREENHOUSE PRODUCTION COSTS, 1979-80 AND 1982-83 CROP YEARS

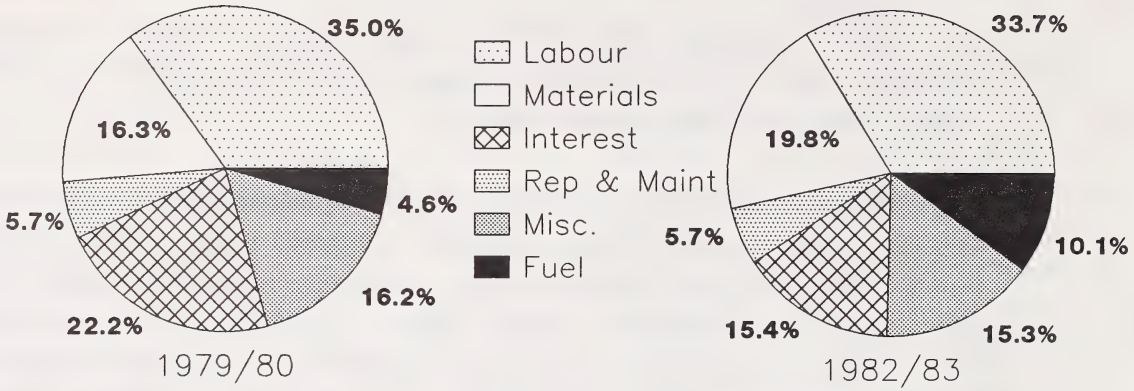
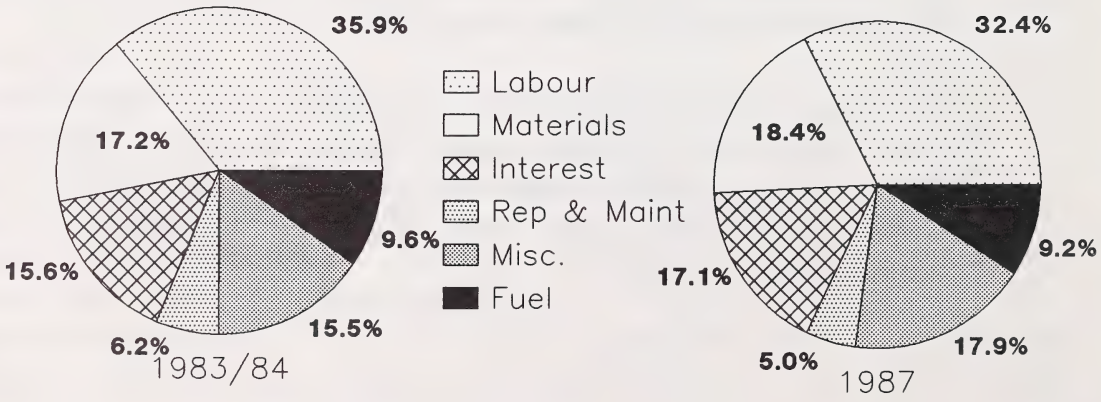


FIGURE 5:
COMPARISON OF GREENHOUSE PRODUCTION COSTS, 1983-84 AND 1987



Miscellaneous costs (small tools, shop supplies, soil testing, office supplies, donations, memberships, travel, and promotional costs other than advertising), utilities, insurance and registration fees, taxes, freight and leasing, advertising, accounting and legal, and marketing costs for 1987 increased to about 19 percent from 17 percent in 1983-84.

SECTION VI COMPARISON OF GREENHOUSE PRODUCTION COSTS AND RETURNS FOR HYDROPONIC TOMATOES AND TOMATOES PRODUCED IN SOIL

Investment Costs for Greenhouses Producing Tomatoes

The results for tomato production were derived from nine survey participants, five of which used hydroponics. The average land base for greenhouses that used soil was 0.83 acres, whereas those and greenhouses that used hydroponics had a land base of 1.15 acres. The building area for conventional greenhouses averaged 11,192 square feet, while that for hydroponically produced tomatoes averaged 13,161 square feet.

For greenhouses that grow tomatoes in soil, the average total investment, including land, buildings, equipment and automotive, was $82,881, or $7.41 per square foot. Average investment cost was $10,055 per greenhouse, or $0.90 per square foot. Hydroponic greenhouses had an average total investment of $113,564, or $8.63 per square foot, and investment costs that averaged at $13,872 per greenhouse, or $1.05 per square foot. Details on investment and investment costs are presented in Table 22.

Operating Costs for Greenhouses Producing Tomatoes

Average operating costs per greenhouse for soil grown and hydroponically grown tomatoes were $36,672 and $48,331, respectively. Operating costs per square foot averaged higher, at $3.67, for hydroponic greenhouses than the conventional greenhouses, at $3.28. The highest expense for both greenhouse systems was hired labour, at $11,660 for tomatoes produced hydroponically and $9,346 for conventional greenhouses. Greenhouse fuel followed with an average cost of $8,083 for hydroponic greenhouses and $6,064 for conventional greenhouses. Average costs were slightly higher for hydroponically produced tomatoes, as can be seen in Table 23.

TABLE 22

AVERAGE INVESTMENT AND INVESTMENT COSTS FOR TOMATOES AND HYDROPONIC TOMATOES, 1987

	Tomatoes in Soil	Tomatoes Hydroponic
Number Surveyed	4	5
Land Area (acres)	0.83	1.15
Land Value ($)	1,412.51	1,954.32
Land Interest ($)	141.25	195.43
Land Interest ($/sq ft)	0.01	0.01
Building Area (sq ft)	11,192.11	13,160.80
Building Investment ($)	59,141.55	81,186.75
Building Interest ($)	5,914.15	8,118.68
Building Depreciation ($)	1,031.00	1,493.85
Avg Building Interest & Deprec ($/sq ft)	0.62	0.73
Equipment Investment ($)	19,674.55	27,170.20
Equipment Interest ($)	1,967.45	2,717.02
Equipment Depreciation ($)	626.15	890.03
Avg Equip Interest & Deprec ($/sq ft)	0.23	0.27
Automotive Investment ($)	2,652.00	3,252.20
Automotive Interest ($)	265.20	325.22
Automotive Depreciation ($)	109.55	132.27
Avg Auto Interest & Deprec ($/sq ft)	0.03	0.03
Average Investment ($)	82,880.56	113,563.50
Average Investment ($/sq ft)	7.41	8.63
Average Investment Costs ($)	10,054.75	13,872.48
Average Investment Costs ($/sq ft)	0.90	1.05

TABLE 23

COMPARISON OF GREENHOUSE OPERATING COSTS FOR TOMATOES AND HYDROPONIC TOMATOES, 1987

	Tomatoes in Soil	Tomatoes Hydroponic
Number Surveyed	4	5
Greenhouse Area (sq ft)	11,192.11	13,160.80
	- - - - - - dollars - - - - - -	
Gross Revenue	46,625.22	59,060.00
Growing Media & Seed/Cuttings	1,428.44	1,639.80
Fertilizer and Chemicals	1,778.22	2,151.80
Containers, Labels & Tags	1,340.00	1,958.20
Hired Labour	9,346.11	11,660.20
Greenhouse Fuel	6,064.11	8,083.40
Utilities[1]	3,155.33	4,880.60
Insurance & Registration Fees[2]	804.33	924.80
Repairs & Maintenance[3]	3,314.00	4,288.20
Freight Leasing & Express	448.22	647.60
Property Taxes	457.89	449.00
Business Taxes	34.04	58.20
Office Supplies	189.44	298.60
Advertising	1,047.11	1,708.80
Accounting & Legal	546.67	818.40
Marketing Costs[4]	2,679.56	3,376.00
Travel, Donations, Memberships	471.22	704.40
Miscellaneous[5]	338.11	417.80
Interest on Operating Capital	3,229.44	4,245.00
Average Operating Costs Per Greenhouse	36,672.26	48,310.80
Average Operating Costs per Sq. Ft.	3.28	3.67

1 Includes power, water, telegram and telephone.
2 Includes motor vehicles, greenhouse and labour insurance.
3 Includes repair, maintenance and fuel expenses for equipment, buildings and motor vehicles.
4 Includes commission and other marketing costs.
5 Includes small tools, shop supplies, soil testing and promotional expenses other than advertising.

Production Costs and Returns for Greenhouses Producing Tomatoes

Tomatoes grown hydroponically brought in average gross revenues of $49,060 per greenhouse, or $4.49 per square foot. Total production costs were considerably higher, averaging 71,826 per greenhouse, or $5.46 per square foot.

Tomatoes grown in conventional greenhouse systems averaged a gross revenue of $46,625, or $4.17 per square foot. Average total production costs of $54,630 per greenhouse, or $4.88 per square foot, were higher than gross returns.

There was a significant difference between the two greenhouse systems for return to management. Both were negative, with hydroponic greenhouses averaging -$12,768, or -$0.97 square foot. Greenhouses producing tomatoes in soil averaged a negative return to management of -$8,005, or -$0.72 per square foot.

Return over operating costs were more evenly matched, at $0.82 per square foot and $0.89 per square foot for hydroponic and conventional greenhouses, respectively. The average operating costs were $10,749 for tomatoes produced hydroponically, and $9,953 for tomatoes grown in soil. The differences in costs and returns are set out in Table 24.

TABLE 24

COMPARISON OF COSTS AND RETURNS BETWEEN TOMATOES AND HYDROPONIC TOMATOES, 1987

	Tomatoes in Soil	Tomatoes Hydroponic
Number Surveyed	4	5
Greenhouse Area (sq ft)	11,192	13,160
	- - - - - - dollars - - - - - -	
Gross Revenue	46,625.22	59,060.00
Gross Revenue Per Sq. Ft.	4.17	4.49
Material Inputs	4,546.66	5,749.80
Hired Labour	9,346.11	11,660.20
Greenhouse Fuel	6,064.11	8,083.40
Utilities	3,155.33	4,880.60
Insurance & Registration Fees	804.33	924.80
Repairs & Maintenance	3,314.00	4,288.20
Freight Leasing and Express	448.22	647.60
Taxes	491.93	507.20
Advertising	1,047.11	1,708.80
Accounting & Legal	546.67	818.40
Marketing Costs	2,679.56	3,376.00
Miscellaneous[1]	998.77	1,420.80
Interest on Operating Capital	3,229.44	4,245.00
Total Operating Costs	36,672.26	48,310.80
Land, Buildings & Equipment Interest	8,288.05	11,356.35
Depreciation	1,766.45	2,515.79
Operator Labour	7,903.44	9,645.20
Total Other Costs	17,957.94	23,517.34
Total Production Costs	54,630.19	71,828.06
Total Production Costs Per Sq. Ft.	4.88	5,46
Return Over Operating Costs	9,952.95	10,749.20
Return Over Operating Costs Per Sq. Ft.	0.89	0.82
Return to Management	(8,004.97)	(12,768.10)
Return to Management Per Sq. Ft.	(0.72)	(0.97)

1 Includes small tools, shop supplies, soil testing, office supplies, donations, memberships, travel and promotional costs other than advertising.

Summary of Costs and Returns

This section provides summaries of the 1987 costs and returns information for the study sample by region, by types of crops grown in the greenhouses, and by the size of greenhouse operations. Twenty-eight greenhouse operators were surveyed to obtain the required data.

When the study sample was divided by region, there were eleven (11) greenhouses (39%) in the north and north-central regions (Group I), and 17 greenhouses (61%) in the south and south-central regions (Group II). Distribution based on the types of crops produced showed 11 operations producing mainly bedding plants, flowers (poinsettias, mums, and roses), potted plants, foliage plants, and a few selected vegetables. Twelve greenhouses produced Long English cucumbers only and 23 operations produced cucumbers and/or tomatoes. According to the size of operation distribution, there were eight greenhouses (29%) in the 0 to 19,999 square feet category (with an average area of 16,555 square feet), 13 greenhouses (46%) were in the range of 20,000 to 44,999 square feet, and the remaining seven greenhouses (25%) were in the over 45,000 square feet category.

Average production costs and returns for the 1987 crop year, summarized according to region, crops produced, and the size of greenhouse operation are presented in Table 25. The major production costs were labour (hired, operator, and family), material inputs, and greenhouse fuel. The relative share of these costs of the total production costs for the study sample were 32 percent, 19 percent, and 9 percent, respectively. Other significant cost items were interest costs, repairs and maintenance, and marketing costs.

TABLE 25

SUMMARY OF GREENHOUSE PRODUCTION COSTS AND RETURNS, 1987

	Regions			Crops Produced		Size of Operation		
	Study Sample	Group I	Group II	Bedding Plants & Flowers	Vege-tabes	up to 19,999 Sq Ft	20,000 to 44,999 Sq Ft	45,000 Sq Ft and Over
Number Surveyed	28	11	17	20	28	8	13	7
Average Area (sq ft)	39,413	44,243	36,288	31,192	18,177	16,554	29,878	83,245
	- - - - - - - - - - - - - - - - dollars per square foot - - - - - - - - - - - - - - - -							
Gross Revenue	7.61	8.74	6.73	9.37	4.67	6.25	5.16	9.56
Material Inputs	1.28	1.49	1.12	1.93	0.39	0.63	0.69	1.83
Hired Labour	1.48	1.81	1.22	2.23	0.51	0.47	0.54	2.33
Greenhouse Fuel	0.64	0.66	0.63	0.67	0.55	0.66	0.48	0.75
Other Operating Costs	1.78	1.74	1.80	1.75	1.68	2.09	1.33	1.99
Operating Costs	5.18	5.70	4.77	6.58	3.13	3.85	3.04	6.90
Land, Building & Equipment Interest & Depreciation	1.06	1.25	0.91	1.16	0.89	0.95	0.81	1.26
Operator Labour	0.74	0.71	0.76	0.51	0.88	1.17	1.14	0.37
Total Other Costs	1.80	1.96	1.67	1.67	1.77	2.12	1.95	1.63
Total Production Costs	6.98	7.66	6.44	8.25	4.90	5.97	5.00	8.53
Return Over Operating Costs	2.44	3.04	1.96	2.79	1.54	2.40	2.12	2.66
Return to Management	0.64	1.08	0.29	1.12	-0.23	0.29	0.17	1.03

Group I is north and north-central regions (3, 4, 5 and 6).
Group II is south and south-central regions (1 and 2).

Average production costs for a greenhouse operation during 1987 amounted to $275,033, or $6.98 per square foot, with an estimated gross revenue of $300,121, or $7.61 per square foot. Average production costs were somewhat higher for operations in north and north-central Alberta (Group I) when compared to those in south and south-central Alberta (Group II). Total production costs averaged $7.66 per square foot for Group I versus $6.44 per square foot for Group II. Gross revenue per square foot of greenhouse area was $8.74 for Group I compared with $6.73 for Group II. Greenhouses in Group I showed higher returns over operating costs ($3.04 per square foot) than Group II greenhouses ($1.96 per square foot). The average return over operating costs for the study sample was $2.44 per square foot. Average return to management was positive, at $1.08 per square foot for Group I greenhouses, and $0.29 per square foot for greenhouses in south and south-central Alberta (Group II). Average return to management for the study sample was positive, at $0.64 per square foot.

The greenhouses producing combination crops showed substantially higher costs and net returns compared to greenhouses producing mainly vegetables (cucumbers and tomatoes). Gross revenue for greenhouses producing combination crops and vegetables was $9.37 and $4.67 per square foot, respectively. Return over operating costs for the combination crop growers was $2.79 per square foot, compared to $1.54 per square foot for vegetable producers. Average return to management was positive for the combination crop group, at $1.12 per square foot. For the vegetable producing group, average return to management was negative at $0.23 per square foot. The above results indicate that diversified greenhouse operations, those producing more than one crop, offered a better return over investment than a single crop operation.

The study sample was further divided by different sizes of operations to develop production costs and returns. Total costs ranged from $5.16 per square foot for the intermediate sized greenhouse operations to $8.53 per square foot for the large operations. In contrast, gross revenue averaged $9.56 per square foot for the large operations, $5.16 per square foot for the intermediate class, and $6.25

per square foot for the small operations. Return over operating costs was highest for the large operations ($3.45 per square foot) with an area of more than 45,000 square feet, followed by the small operations ($2.40 per square foot) and the intermediate ones ($2.12 per square foot). Return over operating costs for the study sample was $2.44 per square foot.

In terms of return to management (profit), all classes of greenhouse operations showed a positive return to management. Estimated profit was $1.03 per square foot for the large operations, $0.29 per square foot for the small, and $0.17 per square foot for the intermediate sized operations.

Average operating and investment costs for 1987 have been summarized according to regions, crops produced, and the size of operation, and are presented in Table 25.

Summary of Findings

Findings of the study are as follows:

i) Greenhouses surveyed for the 1987 study year showed considerable structural diversity. Materials covering the greenhouse frame varied from glass and plastic to fiberglass, acrylic, and polycarbonate. The structure of the greenhouses surveyed in north and north-central Alberta consisted of plastic (64%), fiberglass (24%), and glass (12%). In the south and south-central regions, the greenhouse structures were glass (66%), plastic (30%), and a small amount of polycarbonate and acrylic. Over the years more plastics have been used in the construction of greenhouses. When the whole study sample is considered, 42 percent of the greenhouses were covered by glass, 47 percent by plastic, and 11 percent by fiberglass.

ii) The study results showed that overall costs and returns were higher for greenhouses in north and north-central Alberta when compared to the south and south-central group. The higher costs and returns for Group I operators could be attributed to diversification.

iii) The results of the 1987 survey of the greenhouse industry revealed that greenhouses producing combination crops, i.e., bedding plants, mums, poinsettias, and roses, showed a much higher gross return than that received by operations only growing vegetables.

iv) Greenhouse operations in north and north-central Alberta showed a profit of $2.04 per square foot compared to a profit of $0.29 per square foot for greenhouses in south and south-central Alberta.

v) Greenhouse operations with a larger production area and retailing facilities showed a positive return to management of $1.82 per square foot whereas the medium and small groups showed positive returns to management of $0.17 and $0.29 per square foot, respectively.

vi) The cost of energy, a major concern of greenhouse operators, amounted to 9 percent of the total operating costs in the study sample. It was 9 percent for Group I participants (north and north-central Alberta) and approximately 10 percent for Group II participants (south and south-central Alberta).

The Primary Producer's Energy Rebate Program was very much appreciated by all producers, as the assistance was very timely in reducing greenhouse heating costs. Some of the larger operations expressed concern regarding the maximum limit of the rebate. Several operations suggested that the rebate under this program be tied to the overall use of natural gas and that assistance under this program should be increased and continued. The program is due to expire on December 31, 1988.

vii) Farmers' markets in cities and towns are serving a very useful purpose in the marketing of fresh greenhouse produce, especially bedding plants.

viii) A few growers thought that the provincial government field crops hail insurance program should be extended to greenhouse crops as well.

ix) Incentives should be provided for modernization and expansion of the greenhouse industry in Alberta.

x) Seasonal tariffs should be increased to protect the domestic industry from ever increasing imports of fresh produce. (See Figure 6).

FIGURE 6:
FRESH VEGETABLE IMPORTS
IN ALBERTA 1981-87